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## TRAUMATIC BRAIN INJURY: SAME OR DIFFERENT

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Report Documentation Page				Form Approved OMB No. 0704-0188	
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1. REPORT DATE <b>JUL 2011</b>		2. REPORT TYPE		3. DATES COVERED <b>00-00-2011 to 00-00-2011</b>	
4. TITLE AND SUBTITLE <b>Traumatic Brain Injury: Same or Different</b>				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) <b>Defense and Veterans Brain Injury Center,ACNP-BC,6900 Georgia Avenue, NW,Washington,DC,20307-5001</b>				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT <b>Approved for public release; distribution unlimited</b>					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT <b>Presented at What a Difference an X Makes: The State of Women's Health Research A Focus on Female Veterans, July 22, 2011, Washington DC</b>					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT <b>Same as Report (SAR)</b>	18. NUMBER OF PAGES <b>24</b>	19a. NAME OF RESPONSIBLE PERSON
a. REPORT <b>unclassified</b>	b. ABSTRACT <b>unclassified</b>	c. THIS PAGE <b>unclassified</b>			



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# DISCLOSURES

➤ Nothing to disclose



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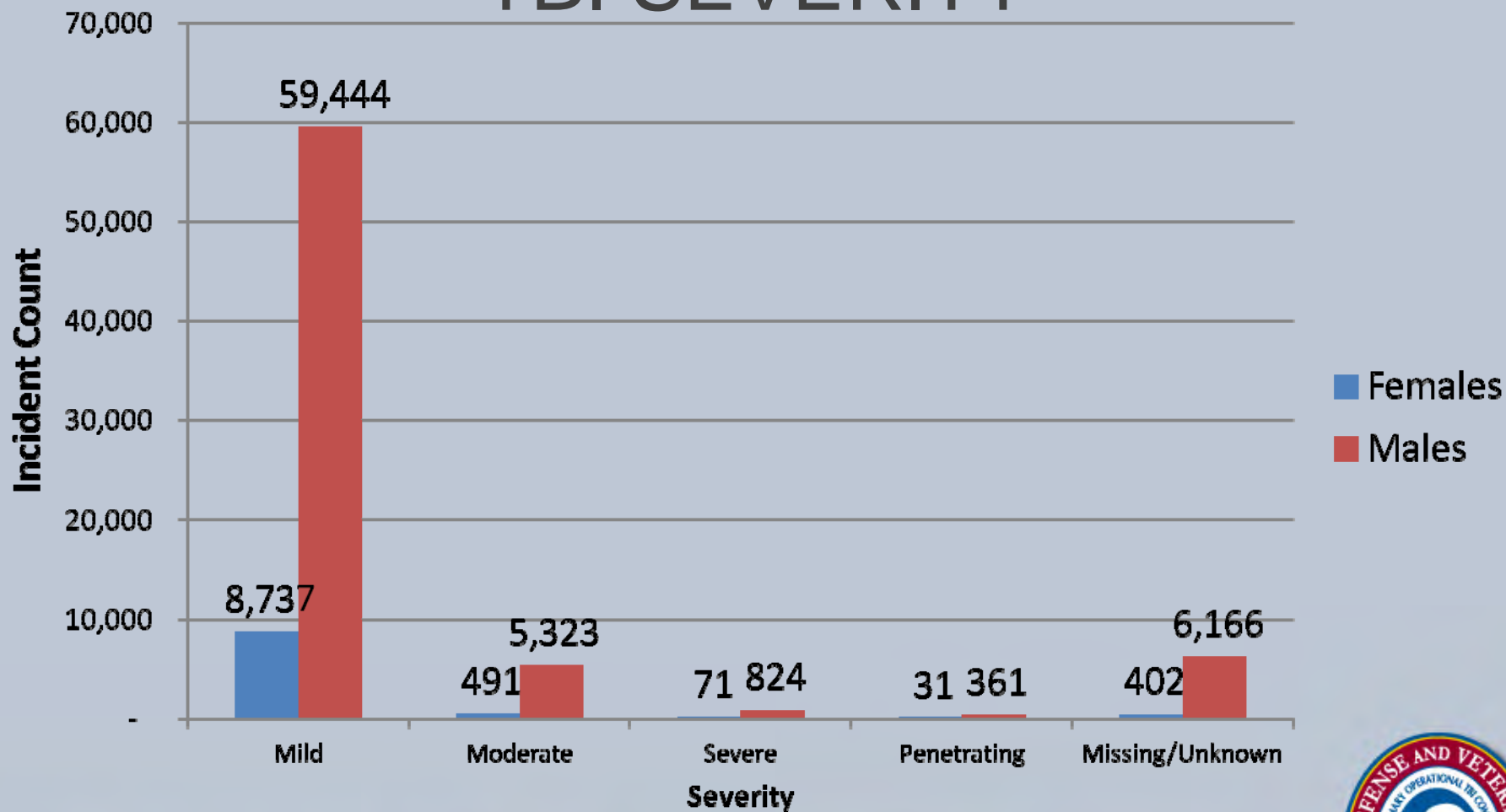
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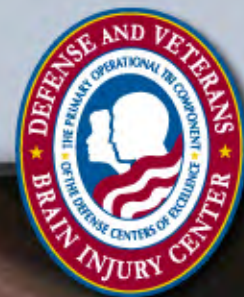
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# POPULATION DESCRIPTIVE TBI SEVERITY



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- Blast versus blunt TBI
- Male versus female



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# BLUNT VERSUS BLAST TBI

	Blunt TBI	Blast TBI
<b>Headache</b> (Lew et al., 2006)	Tension-type	Migraine-like
<b>Dizziness</b> (Hoffer et al., 2009)	Vestibular-ocular reflex - normal to high frequency lag times  Normal motor control testing	Vestibular-ocular reflex - low frequency lag times  Increased latency on motor control testing
<b>Hearing Loss</b> (Lew et al., 2007)	Pure sensorineural (47%) Conductive (11%)	Pure sensorineural (58%) Conductive (8%) Mixed (19%)
<b>Visual complaints</b> (Goodrich et al., 2007)	Blunt polytrauma (20%)	Blast injury (52%)



# COMBAT-RELATED TBI

- Symptom-reporting (3 or more symptoms)
  - » Initial 33.4%
  - » Post-deployment 7.5%
- Most common initial symptoms
  - » Headache
  - » Dizziness
- Most common persistent symptoms
  - » Irritability
  - » Memory problems

Terrio et al., 2009

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# SYMPTOM REPORTING

## ➤ Initial

- » Somatic complaints

## ➤ Persistent

- » Psychological

- » Behavioral

- » Social

DVBIC Care Coordination Program- unpublished data

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# GENDER DIFFERENCES

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# MORTALITY

- No difference in mortality between men and women (Yeung et al., 2011)
- Peri/post menopausal women with lower risk for mortality and morbidity
  - » Pre-menopausal women no different than men (Berry et al., 2009)



# MORTALITY

- Females, especially  $\geq 55$  years of age have higher mortality after isolated severe TBI (Dischinger et al., 2009)





# MORBIDITY

- Women at increased risk for developing Heterotopic Ossification following TBI (Simonsen et al., 2007)



# SEVERE TBI

- Brain tissue oxygenation ( $\text{PbO}^2$ )
  - » Transfusion of PRBCs has greater effect on  $\text{PbO}^2$  in women (Arellano-Orden et al., 2011)



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# OUTCOMES

## ➤ Moderate/Severe (Arellano-Orden et al., 2011)

Males	Females
Restlessness	Headache
Sleep Disturbances	Dizziness
Difficulty with Goal Setting	Loss of Confidence
Phonophobia	Lack of Initiative

# OUTCOMES

## ➤ Meta-analysis

- » Functional outcomes similar (Ottochian et al., 2008)

## ➤ Women have better outcomes than men (Slewa-Younan et al., 2008)

- » Shorter length of stay
- » Improved Glasgow Outcome Score
- » Study excluded pre-existing psychological or substance use disorders

# NEUROENDOCRINE DYSFUNCTION

## ➤ Male

- » Testosterone suppression

## ➤ Females

- » Estrogen suppression

## ➤ Generally transient abnormalities

(Wagener et al., 2010)





# COGNITION

- Similar cognitive outcomes between genders
  - » Exception: visual memory may be better in women (Moore et al., 2010)
- Men at higher risk for developing dementia after TBI (2 meta-analysis) (Starkstein & Jorge, 2005)



# REHABILITATION

- Geriatric study demonstrated that women have:
  - » Shorter lengths of stay
  - » Increased use of home health services

(Graham et al., 2010)



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# SYMPTOM REPORTING

- Adult females with increased reporting of post-concussive symptoms
- Minor females similar reporting to that of males
- No discrimination by sport or safety apparatus utilized

(Preiss-Farzanegan et al., 2009)

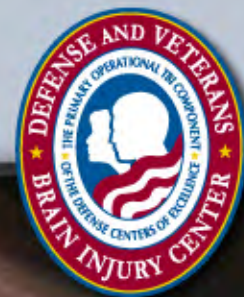


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# PSYCHOLOGICAL SYMPTOMS

- Acutely women report higher levels of
  - » Depressive symptoms
  - » Chronic stress
  - » Pain
  - » Memory problems
- No longer evident at 6-12 month follow-up

(Bay et al., 2009)



# POST-CONCUSSIVE SYNDROME

- Higher prevalence in women
  - » 17% vs 6% (Spinos et al., 2010)
- Gender is predictive of post-concussive syndrome
  - » Female > male (Dischinger et al., 2009)





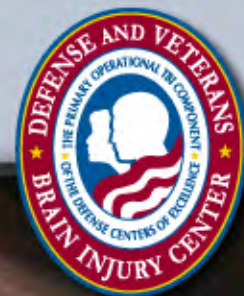
# CONCLUSION

- Studies regarding gender differences have variable results
  - » Selection bias
  - » Sample size
  - » Injury severity
- Scientifically rigorous studies are needed



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